

ABSTRACT

Objectives. This study investigated the secondary prevention effects of a substance abuse primary prevention program.

Methods. Logistic regression analyses were conducted on 4 waves of follow-up data from sixth- and seventh-grade baseline users of cigarettes, alcohol, and marijuana taking part in a school-based program in Indianapolis.

Results. The program demonstrated significant reductions in cigarette use at the initial follow-up (6 months) and alcohol use at the first 2 follow-ups (up to 1.5 years). Models considering repeated measures also showed effects on all 3 substances.

Conclusions. Primary prevention programs are able to reach and influence high-risk adolescents in a non-stigmatizing manner. (*Am J Public Health*. 1998;88:944-948)

Effects of a Community-Based Prevention Program on Decreasing Drug Use in High-Risk Adolescents

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Introduction

Several reviews of the substance abuse prevention literature have concluded that social-influence-based prevention programs can significantly delay the onset of tobacco, alcohol, and other drug use and slow the rate of increase in substance use prevalence among entire populations of early adolescents.¹⁻⁵ Less is known about the capacity of these and other primary prevention programs⁶ to effect decreases in substance use. This is an important question, since some youth have already begun to experiment with drugs by the time that usual primary prevention programs have reached them.^{7,8} Youth exhibiting early drug use relative to their peers are considered at higher risk for later drug use and abuse. The few studies⁹⁻¹⁴ that have investigated the effects of primary prevention programs on those who have already begun using tobacco or other drugs have yielded equivocal results and have not systematically evaluated maintenance of decreases in use. The purpose of this study was to evaluate the secondary prevention effects of a primary prevention program in reducing cigarette, alcohol, and marijuana use among baseline users.

Methods

Intervention

The Midwestern Prevention Project is a community-based substance abuse prevention program for adolescents.¹⁵ The project was implemented in Kansas City, Kan, and Kansas City, Mo, with a quasi-experimental design and later repeated in Indianapolis, Ind, with an experimental design. Primary prevention effects have been published elsewhere.^{15,16} The present study focused on the Indianapolis site, where schools were randomly assigned to intervention or delayed intervention control conditions beginning in fall 1987.¹⁷

A cohort of adolescents from 57 schools in 12 school districts in Marion County, Ind, was studied. Middle and junior high schools within each school district were randomly

assigned to either a social-influence-based drug abuse prevention program (32 schools) or a health-education-as-usual control group (25 schools). In school districts without an even number of schools, the extra school was included in the program.¹⁸

Subjects

The subjects of the Midwestern Prevention Project were entering sixth or seventh graders in public schools or seventh graders in private schools at baseline in fall 1987. Approximately one third of these students were randomly sampled by classroom within each school. A total of 3412 students with parental consent, representing a participation rate of 89.5%, were surveyed at baseline (control group = 1508, program group = 1904). These students were tracked for 4 follow-ups at 6 months, 1.5 years, 2.5 years, and 3.5 years after the baseline survey.

The samples for this study consisted of only adolescents who reported use of cigarettes, alcohol, or marijuana in the previous month at baseline. Four hundred cigarette users (control = 188, program = 212), 613 alcohol users (control = 290, program = 323), and 60 marijuana users (control = 38, program = 22) were included.

Measures

At baseline and each follow-up, students completed a self-report questionnaire

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consisting of 100 items that measured substance use behavior as well as demographic characteristics, attitudes, and social influences related to substance use. The validity and reliability of the questionnaire items averaged more than 7.¹⁵

The dependent variable for this study was the level of students' cigarette, alcohol, and marijuana use in the last month relative to their previous monthly levels of use. Monthly cigarette use levels ranged from none (1) to more than 1 pack (4), monthly alcohol use levels ranged from none (1) to more than 20 drinks (6), and monthly marijuana use levels ranged from none (1) to more than 20 times (6). At each follow-up, a secondary prevention effect was considered to have occurred only if a baseline user had a lower level of substance use after the intervention and remained at that level or moved to an even lower level (0 = nondecreasing use, 1 = decreasing use).

This study focused on the impact of the experimental condition in terms of decreasing levels of substance use among the baseline users. Covariates included ethnicity (non-White or White), gender, socioeconomic status (father's nonprofessional occupation or professional/managerial occupation), and school type and grade (public sixth, public seventh, or private seventh).

Subject Attrition

Subject attrition greatly affects longitudinal studies, because substance users are more likely to drop out of studies than are nonusers.^{19,20} To avoid reductions in sample size, we elected to retain all baseline substance users in the analytical processes by assuming that a student not observed at a certain follow-up was at the same level of substance use as that reported in the next follow-up wave for which data were available. We assumed that students missing after baseline had not decreased their use at all 4 follow-ups.

Analysis Plan

Odds ratios comparing the control and program groups in regard to decreasing level of substance use were examined by means of logistic regression models holding the previously discussed covariates constant. Schools were randomized to program conditions, and student was used as the unit of analysis, a sampling design known as cluster randomization.²¹ Within-school interdependence was taken into account with an SAS/IML²² program developed for the generalized estimating equation.²³⁻²⁵ As a result of the multiple comparisons involved in the analytical

processes for the 4 separate follow-ups, a conservative significance level ($\alpha = .005$) was used to ensure an acceptable overall type I error rate. Analyses were also conducted to incorporate the structure of repeated outcome measures²⁶ by means of the generalized estimating equation.

Results

Subject Characteristics and Attrition

Table 1 shows the demographic characteristics of the baseline substance users by program condition. The 2 groups were quite similar except that, among alcohol users, the control group comprised more seventh graders in public schools and fewer seventh graders in private schools than the program group. The proportions of subjects absent at the follow-ups are summarized in Table 2. Results indicate that only the baseline alcohol users in the control

group had a higher dropout rate at the second follow-up.

Secondary Prevention Effects

Comparisons between the program conditions in terms of the proportion of students who decreased their level of drug use are shown in Figure 1. Without control for any covariates, baseline substance users in the program group consistently demonstrated decreased levels of use relative to the control group across all 4 follow-ups, except for the results for marijuana use at the 3.5-year follow-up. The program showed a secondary prevention effect on decreasing cigarette and alcohol use at 6 months after the intervention. The effect was marginally significant for alcohol at the 1.5-year follow-up and for marijuana at the 6-month follow-up.

The adjusted odds ratios and 95% confidence intervals for decreased use of cigarettes, alcohol, and marijuana among base-

TABLE 1—Demographic Characteristics of Baseline Cigarette, Alcohol, and Marijuana Users in the Program and Control Groups: Midwestern Prevention Project, Indianapolis, Ind

	Program	Control
Baseline cigarette users		
No.	212	188
White, %	81.13	85.64
Male, %	42.45	50.53
High SES, ^a %	18.40	24.47
School type and grade, %		
Public 6th grader	11.79	5.85
Public 7th grader	72.17	81.38
Private 7th grader	16.04	12.77
Mean use level, previous month (SE)	2.59 (0.04)	2.69 (0.04)
Baseline alcohol users		
No.	323	290
White, %	85.76	87.93
Male, %	51.08	49.31
High SES, ^a %	31.27	35.52
School type and grade, ^b %		
Public 6th grader	11.46	11.38
Public 7th grader	50.15	64.83
Private 7th grader	38.39	23.79
Mean use level, previous month (SE)	2.24 (0.04)	2.29 (0.04)
Baseline marijuana users		
No.	22	38
White, %	72.73	82.05
Male, %	36.36	64.10
High SES, ^a %	18.18	20.51
School type and grade, %		
Public 7th grader	90.91	81.58
Private 7th grader	9.09	18.42
Mean use level, previous month (SE)	2.55 (0.13)	3.05 (0.22)

Note. SES = Socioeconomic status.

^aFather with professional occupation.

^bProgram and control groups differ at .001 level.

TABLE 2—Percentage of Attrition for Baseline Cigarette, Alcohol, and Marijuana Users from the Program and Control Groups at 4 Waves of Follow-Up: Midwestern Prevention Project, Indianapolis, Ind

	Program	Control
Baseline cigarette users		
No.	212	188
Subjects absent, %		
6-month follow-up	27.83	30.32
1.5-year follow-up	38.21	43.09
2.5-year follow-up	45.28	54.26
3.5-year follow-up	53.30	53.72
All 4 follow-ups	13.21	18.09
Complete cases, %	25.00	29.26
Baseline alcohol users		
No.	323	290
Subjects absent, %		
6-month follow-up	17.65	22.76
1.5-year follow-up ^a	20.12	30.34
2.5-year follow-up	33.44	38.62
3.5-year follow-up	38.08	39.31
All 4 follow-ups	6.81	11.72
Complete cases, %	42.72	41.03
Baseline marijuana users		
No.	22	38
Subjects absent, %		
6-month follow-up	36.36	52.36
1.5-year follow-up	40.91	63.16
2.5-year follow-up	50.00	76.32
3.5-year follow-up	72.73	68.42
All 4 follow-ups	13.64	36.84
Complete cases, %	13.64	13.16

^aProgram and control groups differ at .005 level.

TABLE 3—Odds Ratios for Decreasing Cigarette, Alcohol, and Marijuana Use among Baseline Users in the Program Relative to the Control Group: Midwestern Prevention Project, Indianapolis, Ind

	Odds Ratio	95% Confidence Interval
Baseline cigarette users		
Separate follow-up		
6-month follow-up	1.83**	1.23, 2.72
1.5-year follow-up	1.37	0.91, 2.07
2.5-year follow-up	1.43*	1.01, 2.01
3.5-year follow-up	1.54	0.82, 2.90
All 4 follow-ups with repeated measures	1.53*	1.05, 2.24
Baseline alcohol users		
Separate follow-up		
6-month follow-up	1.71***	1.29, 2.27
1.5-year follow-up	1.57**	1.15, 2.13
2.5-year follow-up	1.33	0.90, 1.98
3.5-year follow-up	1.22	0.71, 2.09
All 4 follow-ups with repeated measures	1.54**	1.17, 2.02
Baseline marijuana users		
Separate follow-up		
6-month follow-up	2.79	0.64, 12.16
1.5-year follow-up	2.93	0.79, 10.89
2.5-year follow-up	4.07	0.77, 21.52
3.5-year follow-up	0.18	0.02, 1.67
All 4 follow-ups with repeated measures	3.96*	1.29, 12.13

Note. Odds ratios reported for analyses of each of the 4 follow-up waves were adjusted for ethnicity, socioeconomic status, gender, school type (public or private), and grade. Odds ratios reported for analyses of all 4 follow-ups with repeated measures were adjusted for time trend in addition to the other covariates.

* $P < .05$; ** $P < .005$; *** $P < .001$.

line users in the program group relative to the control group are presented in Table 3. The results of the logistic regression analysis conducted for each follow-up indicated secondary prevention effects similar to those presented in Figure 1. Analyses of each follow-up wave separately indicated that the prevention program had a significant secondary prevention effect on baseline cigarette users only at the 6-month follow-up. The secondary prevention effect, however, diminished over time.

Significant secondary prevention effects in terms of reducing alcohol use were detected at the 6-month and 1.5-year follow-ups. No significant secondary prevention effects were detected for baseline marijuana users. Relative to the control group, the program group showed a trend of decreasing use of marijuana at the first 3 follow-up waves. At the final follow-up, the trend was reversed. As demonstrated in Figure 1, only 1 student (4.55%) in the program group and 4 students (10.53%) in the control group decreased their level of marijuana use.

Similar analyses considering classroom as the analysis cluster did not change the results. In general, the intervention program consistently demonstrated a tendency of decreasing use for all 3 substances among the baseline users across all 4 follow-ups, except marijuana users at the 3.5-year follow-up. Furthermore, for subjects who increased their use level, no difference in terms of monthly use level was detected between the program and control groups.

Results obtained from the generalized estimating equation with repeated measures are also presented in Table 3. After adjustment for the same covariates as in the previous analyses along with the secular trend, the experimental condition demonstrated a significant effect at the .05 alpha level in decreasing levels of use among baseline cigarette, alcohol, and marijuana users.

To evaluate whether the secondary prevention effects reported in Table 3 had been biased by the operational definition of decreasing use implemented with missing subjects, we used 2 alternative definitions to categorize decreasing use for these subjects. The first alternative was to assume that each missing subject had nondecreasing status, and the second was to replace the missing values of drug use with the use level at the previous wave. Logistic regression results obtained from each wave of follow-up with the first alternative definition showed the same effects presented in Table 3. The second alternative definition yielded similar results. More secondary prevention effects (cigarettes at follow-up wave 2, alcohol at follow-up waves 3 and 4, and marijuana at

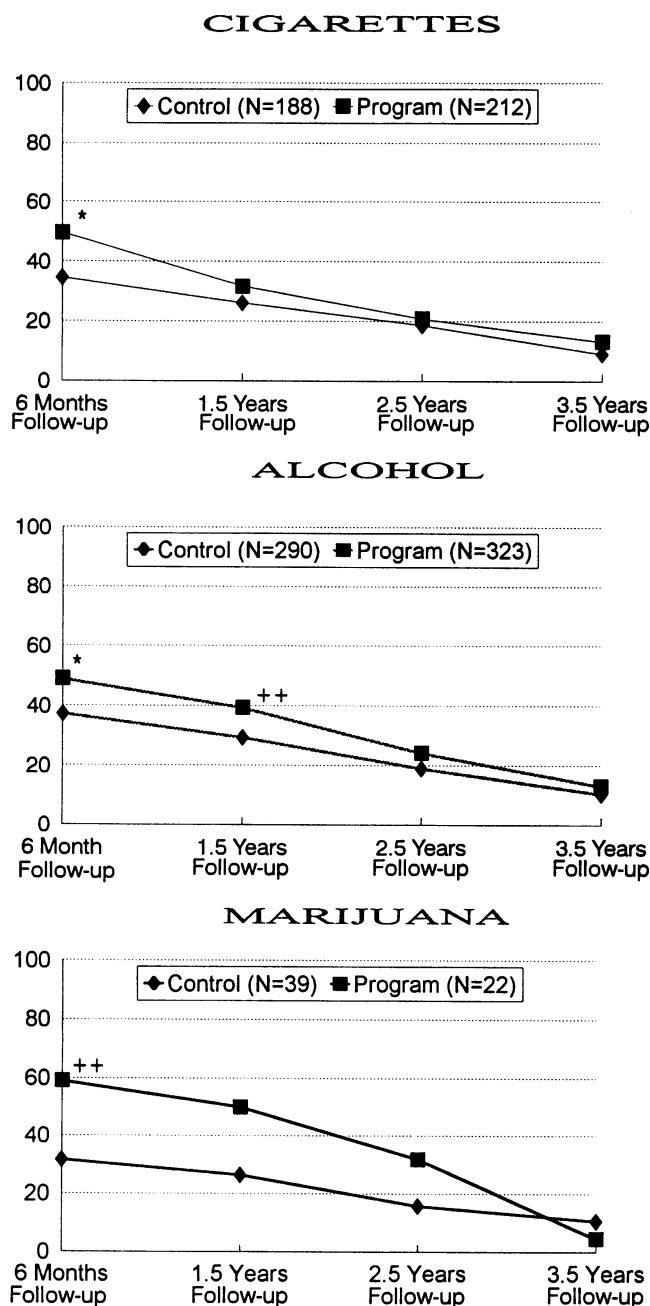


FIGURE 1—Proportion of baseline substance users who decreased use across follow-ups: Midwestern Prevention Project, Indianapolis, Ind (significant at .01 level; *significant at .005 level).**

follow-up waves 1, 2, and 3) became marginally significant. Finally, when only complete cases among the cigarette baseline users and alcohol baseline users ($n = 108$ and $n = 257$, respectively) were included, the logistic regression models yielded larger odds ratios and standard errors but less significant effects than those reported in Table 3. These findings indicate that the more conservative criteria used in this study yielded smaller secondary prevention effects, and more complete cases would

be needed to reduce the standard errors and obtain statistically significant effects.

Discussion

Primary prevention programs have been criticized for affecting future occasional users but not youth at the highest risk for drug abuse (e.g., current users). In this study, we reported 3.5-year follow-up effects of a primary prevention program in

decreasing drug use among adolescents who were users at either sixth or seventh grade. With a very conservative criterion to define decreased use, the results indicate that the program did effect reductions in use, especially cigarette and alcohol use. These secondary prevention effects were significant for cigarette users at the 6-month follow-up and marginally significant at the 2.5-year follow-up. Effects were also found among baseline alcohol users through the 1.5-year follow-up. Consistent with other prevention studies,^{1,5} the effect sizes were small for cigarettes (range: .05–.31) and alcohol (range: .08–.24) and medium for marijuana (range: .38–.58). Although no significant effects were detected among baseline marijuana users, it is important to note that the program group consistently demonstrated greater reductions in all 3 substances across all follow-ups, except marijuana at the 3.5-year follow-up. When the secular trend was also considered, the Midwestern Prevention Project consistently showed significant secondary prevention effects on cigarette, alcohol, and marijuana use.

There are several methodological limitations to this study. For example, a possible threat to the validity of the findings was the reliance on self-reported drug use. However, extensive research conducted on the validity of self-reported smoking dispels this concern,^{27–30} especially if a bogus pipeline activity is built into the procedures for data collection,^{30,31} as was done in the present study. Another possible limitation is that measurements were limited to a fixed point in time (previous month) from year to year, thus leaving open the possibility that the last reported use level may have been an underestimate of actual normal use patterns. However, given that this study was fully randomized, the program and control groups should have been equal in regard to their validity estimates of the point prevalence of drug use measured.

This research suggests that social-influence-based primary prevention programs can have an impact on not only students who are nonusers at baseline but also those who have begun to use drugs. The advantage of such a primary prevention program is that it may reach and affect a “silent,” not-yet-identified high-risk population of early drug users in a nonstigmatizing, nonlabeling fashion at an age when youth are more easily persuaded (treating the young users, in effect, like nonusers contemplating use). Future studies should investigate secondary prevention effects with analytical strategies that incorporate missing values imputation under varying assumptions of use patterns, as

well as the potential effects of primary prevention strategies on students at various levels of risk for drug use. □

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